Check List 9(5): 1062–1066, 2013
© 2013 Check List and Authors
ISSN 1809-127X (available at *www.checklist.org.br*)

Check List
Journal of species lists and distribution

NOTES ON GEOGRAPHIC DISTRIBUTION

New records of *Ischnocnema verrucosa* Reinhart and Lütken, 1862 and *I. surda* Canedo, Pimenta, Leite and Caramaschi, 2010 (Anura, Brachycephalidae) in Minas Gerais state, Brazil

Emanuel Teixeira da Silva [1,2,3*], Patrícia da Silva Santos [2,3], Harley Leandro Coelho [4], Renato de Souza Viana [5], Rodrigo Carrara Heitor [6] and Paulo Christiano de Anchietta Garcia [2,3]

1 Centro Universitário de Caratinga, Centro de Estudos em Biologia. Rua Niterói, 230, Bairro Nossa Senhora das Graças. CEP 35300-354. Caratinga, MG, Brazil.
2 Universidade Federal de Minas Gerais, Instituto de Ciências Biológicas, Departamento de Zoologia, Laboratório de Herpetologia. Avenida Antônio Carlos, 6627, Pampulha. CEP 31270-901. Belo Horizonte, MG, Brazil.
3 Universidade Federal de Minas Gerais, Programa de Pós Graduação em Ecologia Conservação e Manejo da Vida Silvestre. Avenida Antônio Carlos, 6627, Pampulha. CEP 31270-901. Belo Horizonte, MG, Brazil.
4 Grupo de Pesquisas Paleoarqueológicas Fossilis, Rua Vereador Lindolfo Soares de Carvalho 106, 35300-140, Caratinga, MG, Brazil.
5 Centro Universitário de Caratinga, Programa de Especialização em Saúde e Meio Ambiente, Avenida Moacyr de Matos 87. CEP 35300-047. Caratinga, MG, Brasil.
6 Faculdades Vale do Carangola, Universidade do Estado de Minas Gerais, Praça dos Estudantes 23. CEP 36800-000. Carangola, MG, Brazil.
* Corresponding author. Email: *etsbio@yahoo.com.br*

ABSTRACT: Herein we provide new records of the leaf litter frogs *Ischnocnema verrucosa* and *I. surda* for the state of Minas Gerais, Southeast of Brazil. Our records fill the current gap in the geographic distribution of *I. verrucosa* in the east of Minas Gerais, and extend the distribution of *I. surda* in about 117 km straight southeast of its type locality. We also provide discussions regarding diagnose characters of *I. surda*.

The frog genus *Ischnocnema* Reinhardt and Lütken 1862 currently contains 32 species distributed in central, eastern and southern Brazil, adjacent northern Argentina and possibly into adjacent Paraguay (Canedo and Haddad 2012; Frost 2012). Several of these species are important members of the leaf litter frog communities in Atlantic Forest remains (Martins *et al.* 2010). Four species series are currently recognized in this genus: *Ischnocnema guentheri*, *I. lactea*, *I. parva* and *I. verrucosa* series, which were recognized as well supported clades in the phylogenetic analyses of Canedo and Haddad (2012).

Hedges *et al*. (2008) defined the *Ischnocnema verrucosa* species series in order to include *I. verrucosa* and *I. juipoca*, by sharing the following characters: SVL ranging from 21 mm (males only, *I. juipoca*) to 26 mm (females, *I. verrucosa*); body moderate in shape with short legs (shank length < 55% SVL); snout subacuminate in dorsal view; tympanic membrane differentiated or not; dorsum tuberculate, and venter areolate; condition of the nuptial pads unknown; finger I approximately the same length as finger II, and small digital discs. Canedo *et al*. (2010) described *I. surda* and included *I. octavioi* and *I. penaxavantinho* in this species series, based on morphologic evidence. Canedo and Haddad (2012) included *I. abdita* and *I. bolbodactyla* in the *I. verrucosa* series, based on molecular phylogenetic analyses. Thus, the series of *I. verrucosa* currently encompasses seven species (Canedo and Haddad 2012).

Ischnocnema verrucosa (Figure 1) is found in some localities of the Atlantic Forest biome, in states of Minas Gerais, Espírito Santo and Bahia (Canedo *et al*. 2010; Orrico *et al*. 2010; Freitas *et al*. 2011; Montesinos *et al*. 2012) (Figure 2). In Minas Gerais the species was until recently known only from its type locality, the municipality of Juiz de Fora (Caramaschi and Canedo 2006; Canedo *et al*. 2010). Moura *et al*. (2012) reported *I. verrucosa* from Parque Estadual da Serra do Brigadeiro (PESB), municipality of Araponga, about 145 km straight northeast of Juiz de Fora, but in the present work we discuss on the identity of the record of Moura *et al*. (2012) (see below).

FIGURE 1. Adult male of *Ischnocnema verrucosa* (MZUFV 11525 in life; CRC 17.62 mm) from Sítio Carmelita, Piedade de Caratinga, state of Minas Gerais, southeastern Brazil. Photo: Emanuel T. da Silva.

Ischnocnema surda was originally reported by Canedo *et al*. (2010) for the municipalities of Ouro Preto, Mariana, Marliéria, Rio Piracicaba, and Santa Bárbara. Later, São Pedro and Feio (2011) recorded *I. surda* in the municipality of Ouro Branco. All these localities, except Marliéria,

are in a mountainous region composing the southern portion of the Espinhaço Mountain Range in Minas Gerais (Nascimento *et al*. 2005). Herein we provide new records of *I. verrucosa* and *I. surda* for Minas Gerais state, and discuss about the characters that diagnose *I. surda*.

The specimens referred herein were collected during field surveys carried out from 2007 to 2011, and are deposited at the collection of amphibians of Museu de Zoologia João Moojen, Universidade Federal de Viçosa (MZUFV), Viçosa, state of Minas Gerais, and collection of amphibians of Universidade Federal de Minas Gerais (UFMG - Amphibia), Belo Horizonte, state of Minas Gerais, Brazil. Collection permits were granted by Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis - IBAMA (# 02015.003624/2007-20) and Instituto Chico Mendes de Conservação da Biodiversidade - ICMBio (# 17152-1, 26696-1 and 25082-1). Additional specimens collected before this period and housed at MZUFV were also included here. According to Canedo *et al*. (2010), the externally indistinct tympanum and tympanic annulus and the distinct white glandular-appearing nuptial pads in males distinguish *I. surda* from the other species in the *I. verrucosa* series. Here we considered the distinctiveness of the tympanum and tympanic annulus to differentiate the examined specimens (*i. e*. tympanum and tympanic annulus externally visible; Figures 3A, B, C). Topotypes of *I. surda* (MZUFV 2318 and 2319) were also examined to help in the species identification.

Ischnocnema verrucosa is reported from five new localities, all of which are located south of the Rio Doce in Minas Gerais (Figures 2 and 4; red circles): 1) Reserva Particular do Patrimônio Natural Feliciano Miguel Abdala (19°44'42" S, 41°49'19" W, 454 m elevation), municipality of Caratinga (MZUFV 4746); 2) a forest fragment in the area of indirect influence of the Areia Branca Hydroelectric Power Plant (19°47'57" S, 41°42'59" W, 381 m elevation), municipality of Ipanema (MZUFV 7999); 3) Sítio Carmelita (19°45'35" S, 42°05'23" W, 868 m elevation), municipality of Piedade de Caratinga (MZUFV 8771, 11028-11030, 11525); 4) Reserva Particular do Patrimônio Natural Mata do Sossego (20°04'13" S, 42°04'37" W, 1180-1639 m elevation), municipality of Simonésia (UFMG - A 9756-9758); and 5) Mata de São Sebastião da Barra (20°36'47" S, 41°57'25" W, 780 m elevation), municipality of Espera Feliz (MZUFV 11647-11648).

Ischnocnema surda is reported from two new localities, all of them located south of the Espinhaço Mountain Range. The first is Estação de Pesquisa, Treinamento e Educação Ambiental Mata do Paraíso (20°48'09" S, 42°51'32" W, about 700 m elevation), municipality of Viçosa (MZUFV 1814, 6918, 7108, 7135, 7402 and 7403) (Figures 2 and 4, red squares). Moura *et al*. (2012) reported *I. verrucosa* from Parque Estadual da Serra do Brigadeiro (PESB), municipality of Araponga, distant about 40 km straight east from Viçosa municipality. We examined the voucher specimens cited by Moura *et al*. (2012) (MZUFV 10340-10341, 10520-10521, 11457), and verified that their tympanum and tympanic annulus are externally indistinct (Figure 2F). Thus, we concluded that the species of the *I. verrucosa* series occurring at PESB are actually *I. surda*.

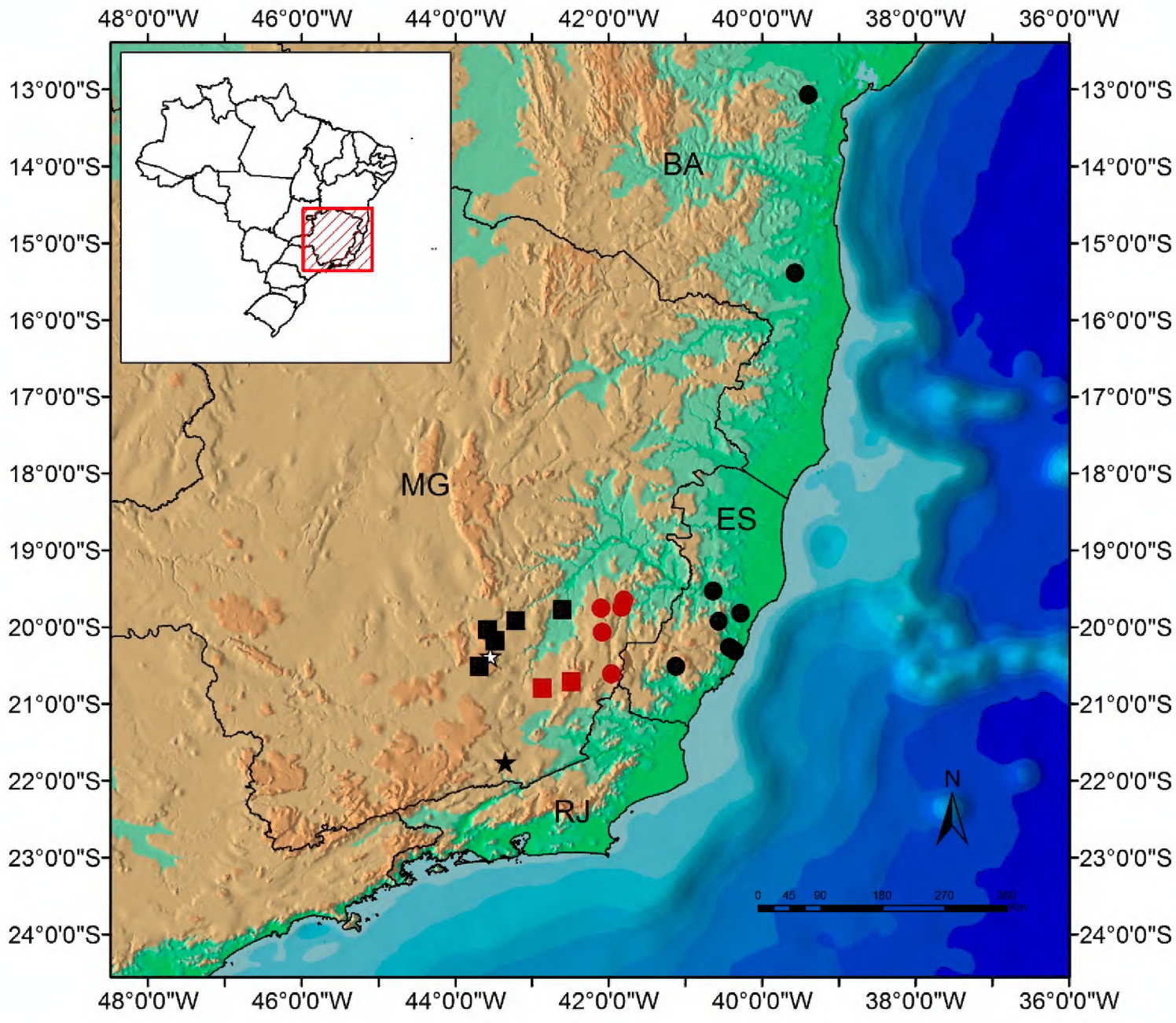

FIGURE 2. Geographic distribution of *Ischnocnema verrucosa* (circles and black star) and *I. surda* (squares and white star). BA = state of Bahia; ES = state of Espírito Santo; MG = state of Minas Gerais; RJ = state of Rio de Janeiro. Stars = type localities; black symbols = literature records (Canedo et al., 2010; Orrico et al., 2010; Freitas et al., 2011; São Pedro and Feio 2011; Montesinos et al. 2012); red symbols = new records. See Figure 4 for a detailed view of the records in state of Minas Gerais. Map by Patrícia S. Santos.

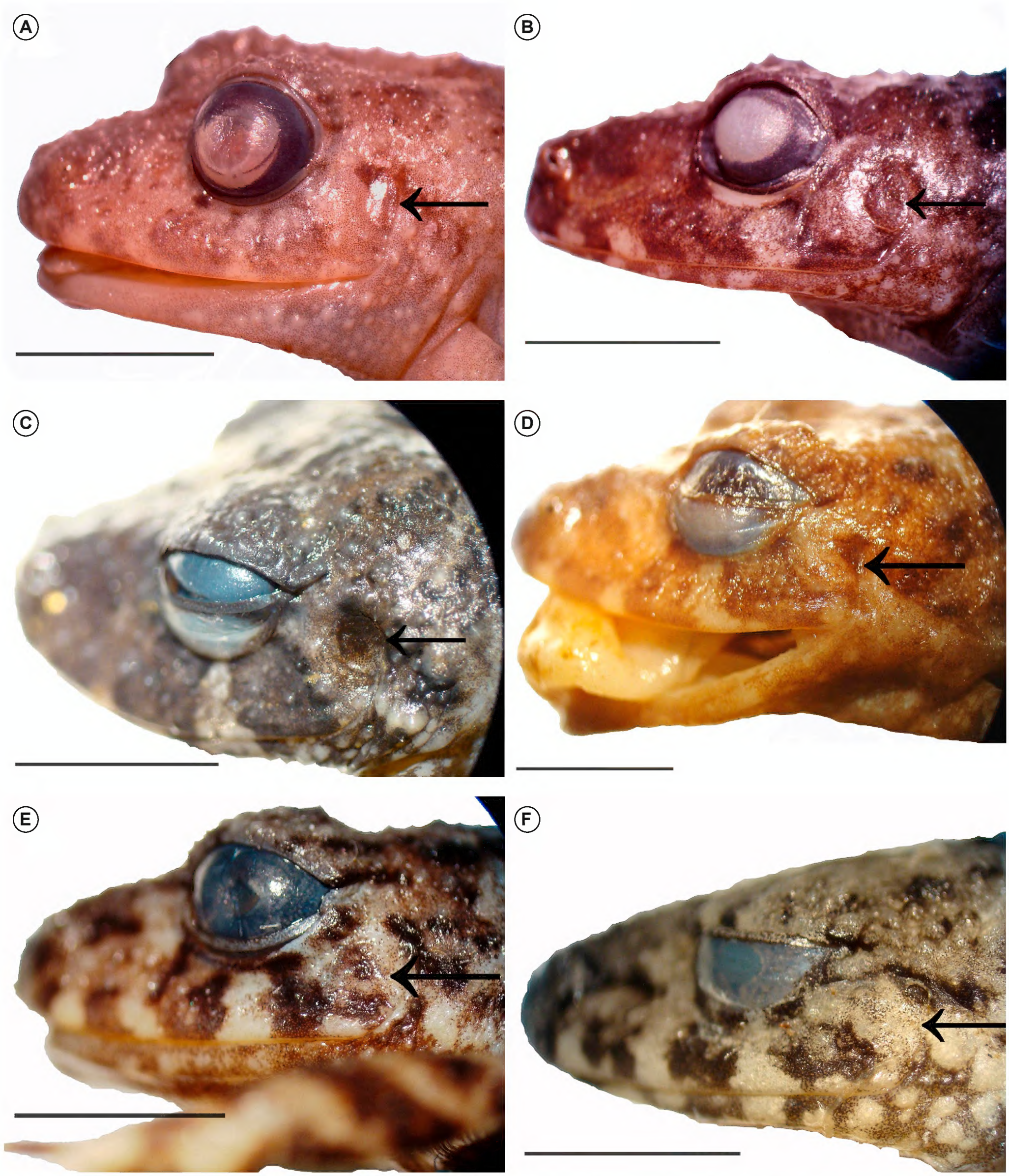

Figure 3. Preserved specimens of *Ischnocnema verrucosa* (A-C) and *I. surda* (D-F); black arrows indicate the tympanic region. A: MZUFV 4746 (RPPN Feliciano Miguel Abdala, Caratinga, MG); B: MZUFV 11028 (Sítio Carmelita, Piedade de Caratinga, MG); C: UFMG - A 9756 (RPPN Mata do Sossego, Simonésia, MG). D: MZUFV 2318, (Estação Ecológica do Tripuí, Ouro Preto, MG - topotype of *I. surda*). E: MZUFV 6918 (Estação de Pesquisa, Treinamento e Educação Ambiental Mata do Paraíso, Viçosa, MG). F: MZUFV 10643 (Parque Estadual da Serra do Brigadeiro, Araponga, MG) (scale bars = 5 mm). Note that tympanum is not evident in *I. surda* specimens. Photos: Emanuel T. da Silva.

The occurrences of the same anuran species in areas of the Mantiqueira Mountain Range and of the Southern Espinhaço Mountain Range in the Southeast of Brazil raise hypothesis about biogeographic homologies between these two mountainous formations (Cruz and Feio 2007). Examples of such species are *Aplastodiscus cavicola* (São Pedro and Feio 2011; E. T. Silva and P. S. Santos, personal observations), *Hylodes babax* (Pirani *et al*. 2010; Santos *et al*. 2012), *Ischnocnema izecksohni* (Taucce *et al*. 2012), and *Physalaemus maximus* (Baêta *et al.* 2005; São Pedro and Feio 2011; Moura *et al*. 2012). The records of *I. surda* in Viçosa municipality and PESB, both areas of the Mantiqueira Mountain Range, and in the Southern Espinhaço (Canedo *et al*. 2010; São Pedro and Feio 2011)

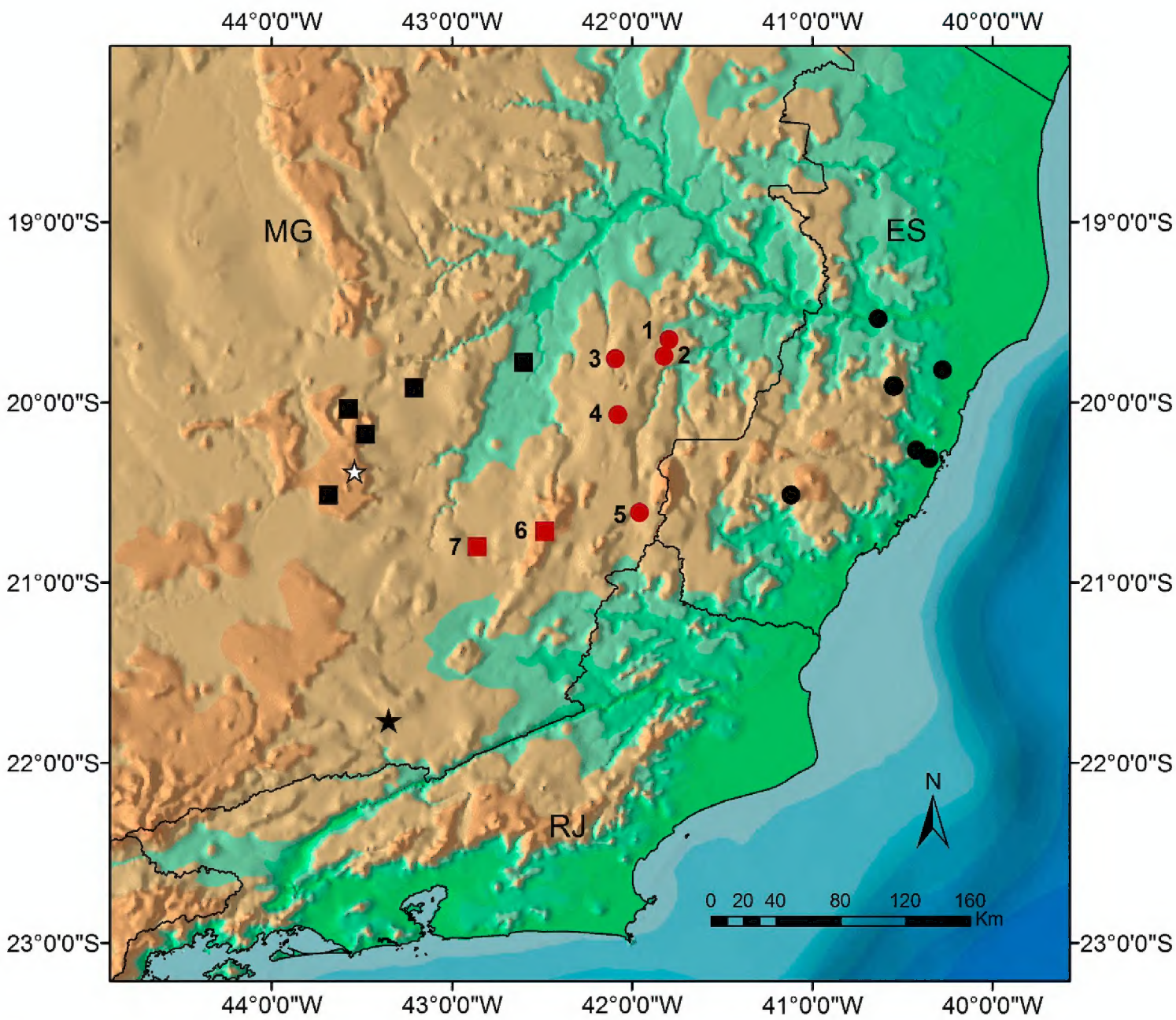

Figure 4. Detail of the Southeast of Brazil where *Ischnocnema surda* (squares and white star) and *I. verrucosa* (circles and black star) have been recorded, with emphasis on localities in state of Minas Gerais. ES = state of Espírito Santo; MG = state of Minas Gerais; RJ = state of Rio de Janeiro. Stars = type localities; black symbols = literature records; red symbols = new records. 1 = Area of indirect influence of the Areia Branca Hydroelectric Power Plant, municipality of Ipanema; 2 = Reserva Particular do Patrimônio Natural Feliciano Miguel Abdala, municipality of Caratinga; 3 = Sítio Carmelita, municipality of Piedade de Caratinga; 4 = Reserva Particular do Patrimônio Natural Mata do Sossego, municipality of Simonésia; 5 = Mata de São Sebastião da Barra, municipality of Espera Feliz; 6 = Parque Estadual da Serra do Brigadeiro (PESB), municipality of Araponga (cited as *I. verrucosa* by Moura et al. 2012); 7 = Estação de Pesquisa, Treinamento e Educação Ambiental Mata do Paraíso, municipality of Viçosa. Map by Patrícia S. Santos.

reinforce that hypothesis. However, the high morphological similarity between these species, as well as the proximity between their distribution areas in northern portion of the Mantiqueira (PESB and Espera Feliz - Figure 4) indicate the need for studies focused on the phylogeography of the *I. verrucosa* species complex to better elucidate the taxonomic identity of both species.

Ischnocnema verrucosa is considered a Data Deficient (DD) species in the IUCN Red List (Nascimento *et al.* 2004). However, in the revised version of the red list of the fauna of Minas Gerais it was listed as Least Concern (LC) (Fundação Biodiversitas 2007), even with the presence of only one confirmed record for the species in Minas Gerais at that time (the type locality). Our records and the occurrence of this species further north, in the state of Bahia (Orrico *et al.*, 2010; Freitas *et al.*, 2011) suggest that *I. verrucosa* may be more widespread along its extent of distribution, and reinforce its placement in the LC category in Minas Gerais, although there is still a lack of information on its biology and ecological requirements. For *Ischnocnema surda* there is no information concerning its conservation status, which demands further investigation.

Acknowledgments: We are grateful to Felipe S. F. Leite for his useful suggestions on the first draft of this manuscript; to all the colleagues who helped us in the fieldworks; Renato Neves Feio for permitting us to examine the specimens under his care at MZUFV; Mr. Dásio Alves da Silva and the Ordem Carmelita Descalça no Brasil, represented by Friar Leandro Alcides Pereira for allowing field facilities in Piedade de Caratinga; Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) and U.S. Fish & Wildlife Service for financial support and Fundação Biodiversitas for logistic support and permission for research at RPPN Mata do Sossego. Two anonymous reviewers also provided useful suggestions on the final version of this manuscript. PSS would also like to thank Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the fellowship granted during this study. PCAG thanks FAPEMIG (PPM Program) and CNPq for the Research Fellowship.

Literature Cited

Baêta D., B. Assis, P.H. Bernardo, L.O. Drummond, V.A. São-Pedro and M.R.S. Pires. 2005. Geographic distribution. *Physalaemus maximus*. *Herpetological Review* 36(2): 200.

Canedo, C., B.V.S. Pimenta, F.S.F. Leite and U. Caramaschi. 2010. New Species of *Ischnocnema* (Anura: Brachycephalidae) from the State of Minas Gerais, Southeastern Brazil, with Comments on the *I. verrucosa* Species Series. *Copeia* 2010(4): 629-634.

Canedo, C. and C.F.B. Haddad. 2012. Phylogenetic relationships within anuran clade Terrarana, with emphasis on the placement of Brazilian Atlantic rainforest frogs genus *Ischnocnema* (Anura: Brachycephalidae). *Molecular Phylogenetics and Evolution* 65(2): 610-620.

Caramaschi, U. and C. Canedo. 2006. Reassessment of the taxonomic status of the genera *Ischnocnema* Reinhardt and Lütken, 1862 and *Oreobates* Jiménez-de-la-Espada, 1872, with notes on the synonymy of *Leiuperus verrucosus* Reinhardt and Lütken, 1862 (Anura: Leptodactylidae). *Zootaxa* (1116): 43-54.

Cruz, C.A.G., and R.N. Feio. 2007. Endemismos em anfíbios em áreas de altitude na Mata Atlântica no sudeste do Brasil; p. 117-126 *In* L.B. Nascimento and M.E. Oliveira (ed.). *Herpetologia no Brasil II*. Belo Horizonte: Sociedade Brasileira de Herpetologia.

Freitas, M.A., B.H. Souza and P.M. Fonseca. 2011. *Ischnocnema verrucosa* - geographic distribution. Herpetological Review 42(3): 385.

Frost, D. 2012. *Amphibian Species of the World: an Online Reference. Version 5.6* (1 October, 2012). Electronic Database accessible at http://research.amnh.org/herpetology/amphibian. American

Museum of Natural History: New York, USA. Captured on 16 October 2013.

Fundação Biodiversitas. 2007. *Revisão das listas das espécies da flora e da fauna ameaçadas de extinção do estado de Minas Gerais*. Relatório Final, Volume 3 (Resultados: Lista Vermelha da Fauna de Minas Gerais). Electronic Database accessible at http://www.biodiversitas.org.br/listas-mg/lista_faunamg.asp. Belo Horizonte, Minas Gerais, Brazil. Captured on 11 June 2010.

Martins, A.C.J.S., M.C. Kiefer, C.C. Siqueira, M. Van Sluys, V.A. Menezes, C.F.D. Rocha. 2010. Ecology of *Ischnocnema parva* (Anura: Brachycephalidae) at the Atlantic Rainforest of Serra da Concórdia, State of Rio de Janeiro, Brazil. *Zoologia* 27(2): 201-208.

Montesinos, R., P.L.V. Peloso, D.A. Koski, A.P. Valadares and J.L. Gasparini. 2012. Frogs and toads of the Pedra Azul–Forno Grande Biodiversity Corridor, southeastern Brazil. *Check List* 8(1): 102-111.

Moura, M.R., A.P. Motta, V.D. Fernandes and R.N. Feio. 2012. Herpetofauna da Serra do Brigadeiro, um remanescente de Mata Atlântica em Minas Gerais, Sudeste do Brasil. *Biota Neotropica* 12(1): 209-235.

Nascimento, L.B., R. Bastos and D. Silvano. 2004. *Ischnocnema verrucosa*. *In* IUCN 2010. *IUCN Red List of Threatened Species. Version 2010.4*. Electronic Database accessible at http://www.iucnredlist.org/. Captured on 27 January 2011.

Nascimento, L.B., M. Wachlevscki and F.S.F. Leite. 2005. Anuros; p. 209-230 *In* A.C. Silva, L.C.V.S.F. Pedreira and P.A.A. Abreu (ed.). *Serra do Espinhaço Meridional: paisagens e ambientes*. Belo Horizonte: O Lutador.

Orrico, V.G.D. 2010. Amphibia, Anura, Brachycephalidae, *Ischnocnema verrucosa* Reinhardt and Lütken, 1862: Distribution extension to northeastern Brazil. *Check List* 6(2): 246 -247.

Pirani, R.M., S. Mângia, D.J. Santana, B. Assis and R.N. Feio. 2010. Rediscovery, distribution extension and natural history notes of *Hylodes babax* (Anura, Hylodidae) with comments on southeastern Brazil biogeography. *South American Journal of Herpetology* 5 (2):83-88.

Santos, P.S., E.T. Silva, B.H.B. Felhberg, M.T.T. Santos, Zaidan, B.F. and P.C.A. Garcia. 2012. Amphibia, Anura, *Hylodes babax* Heyer, 1982 (Hylodidae), *Dendropsophus ruschii* (Weygoldt and Peixoto, 1987) and *Bokermannohyla ibitipoca* (Caramaschi and Feio, 1990) (Hylidae): Distribution extension and geographic distribution map. *Check List* 8(2): 313-316.

São Pedro, V.A. and R.N. Feio. Anuran species composition from Serra do Ouro Branco, southernmost Espinhaço Mountain Range, state of Minas Gerais, Brazil. *Check List* 7(5): 671-680.

Taucce, P.P.G., F.S.F. Leite, P.S. Santos, R.N. Feio and P.C.A. Garcia. 2012. The advertisement call, color patterns and distribution of *Ischnocnema izecksohni* (Caramaschi and Kisteumacher, 1989) (Anura, Brachycephalidae). *Papéis Avulsos de Zoologia* 52(9): 111-119.

Received: August 2012
Accepted: August 2013
Published online: October 2013
Editorial responsibility: Marcelo Nogueira de Carvalho Kokubum